Pregnant women with significant medical conditions: anaesthetic implications

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Anaesthetic assessment plays a vital role in the successful management of the pregnant patient with coexisting medical diseases. This has been highlighted by successive reports of the Confidential Enquiries into Maternal Deaths (CEMD). Advances in medical care have resulted in an increasing number of women with concomitant diseases becoming pregnant. The effects of the physiological changes of pregnancy on the disease must be given due consideration in patient evaluation and management. In this review, some of the common problems will be discussed.

Cardiac diseases

There has been a change in the pattern of cardiac disease in the Western world; rheumatic heart disease has become less common but the incidence of congenital and ischaemic heart diseases has increased. A number of physiological changes of pregnancy affect the cardiovascular system (Table 1). Ideally, all pregnant women with cardiac disease should have preconception counselling, full history and examination, and optimization of their condition. Care during pregnancy should be guided by a meticulous multidisciplinary plan for management during pregnancy, delivery and the postpartum period. ECG, echocardiography and chest radiography should be undertaken where appropriate. It is useful to classify the severity of the cardiac disease using the New York Heart association (NYHA) classification (Table 2).

Women with NYHA Class 1 or 2 heart disease usually present little problem in pregnancy or labour; however, those with more severe cardiac disease may not tolerate the physiological changes of pregnancy, especially as they approach 20–28 weeks gestation. The latter should be managed by a multidisciplinary team, including 1–2 weekly assessments by an experienced clinician. Potential maternal problems include arrhythmia, heart failure, hypoxaemia (worsening of right to left shunt) and deep venous thrombosis (DVT). Treatment for arrhythmia and heart failure is as for non-pregnant patients, bearing in mind the possibility of adverse effects to the foetus (e.g. hypothyroidism with amiodarone). DVT prophylaxis should be considered, particularly in those requiring prolonged bed rest.

Epidural analgesia removes the stress response to the pain of labour in cardiac patients and facilitates a vaginal delivery. Labour should be conducted in the left lateral decubitus position to attenuate haemodynamic fluctuations associated with contractions in the supine position. In the third stage, there is always the risk of pulmonary oedema caused by fluid shift; this can be minimized by decreased afterload associated with epidural analgesia. Syntocinon, if required, should be infused very slowly and in dilute solution.

Modern low dose epidural (0.1% bupivacaine plus fentanyl 2–4 μg) techniques cause little sympathetic block and therefore are

Table 1 Physiological changes of pregnancy affecting the cardiovascular system

Increased CO (maximum 40% at 20–28 weeks gestation)
Increased SV
Increased HR (10–20 beats min^{-1})
Decreased SVR and PVR (25–30%)
Decreased BP in trimesters I and II; increased in trimester III
Decreased plasma oncotic pressure (10–15%);
Increased CO in labour (25–30%)
Supine hypotension may reduce CO (up to 20%)
Autotransfusion of blood from the placenta in third stage

CO = cardiac output; SVR = systemic vascular resistance; HR = heart rate; BP = blood pressure; SV = stroke volume; PVR = pulmonary vascular resistance.

Table 2 New York Heart Association (NYHA) classification

NYHA 1	Known cardiac disease with no limitation of physical activity and no objective evidence of cardiovascular disease
NYHA 2	Slight limitation of normal physical activity and objective evidence of minimal disease
NYHA 3	Marked limitation of physical activity and objective evidence of moderate disease
NYHA 4	Severe limitation of activity including symptoms at rest and objective evidence of severe disease

Key points

Effects of the physiological changes of pregnancy on concomitant disease should always be considered.

A multidisciplinary approach is essential in pregnant women with significant concomitant disease.

Pre-pregnancy counselling is recommended where appropriate.

Endocarditis prophylaxis is essential in women with relevant cardiovascular disease.

Regional analgesia is usually appropriate in the presence of comorbidities.

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safe for most women with cardiac disease. Epidurals are beneficial to women with left heart failure. However, in those with heart disease in whom a drop in systemic vascular resistance would be deleterious, epidural or intrathecal opioid analgesia may be appropriate. Epidural analgesia may be considered in some cases of aortic stenosis where the gradient is not too great. Endocarditis prophylaxis is recommended in all cases of valvular heart disease.

Women with cardiac disease need careful monitoring (non-invasive and invasive) throughout labour and the puerperium. Anaesthesia for operative procedures should be tailored to individual needs. Regional and general anaesthesia have been used in most conditions. The UK registry of high-risk obstetric anaesthesia on cardiac disease revealed slow incremental epidural anaesthesia and incremental combined spinal-epidural (CSE) (small intrathecal dose followed by careful incremental epidural top-ups) were both shown to be popular, combining the advantages of reduction of afterload with relative haemodynamic stability. General anaesthesia should be opioid-based with a modified rapid intubation sequence with non-depolarizing neuromuscular blocking agent. Postoperative management should be in a high dependency unit.

Respiratory disease

Lung disease may be primarily obstructive (e.g. asthma, bronchiectasis, cystic fibrosis) or restrictive (e.g. sarcoid, fibrotic disease, post-radiation fibrosis, fibrosing alveolitis). The most common respiratory problem is asthma. Symptoms may be exacerbated by the increased respiratory demands of pregnancy and a number of important physiological changes (Table 3).

Respiration is affected early in pregnancy as a result of progesterone (enhanced by oestrogen) increasing the sensitivity of chemoreceptors to carbon dioxide. Patients with respiratory disease, in particular those with asthma are aware of the hyperventilation early in pregnancy and need reassurance. In the second trimester, airway closure may occur within normal tidal ventilation in a significant number of women in the supine position and, towards the end of pregnancy, the enlarging uterus displaces the diaphragm and reduces functional residual capacity (FRC) to 80% of pre-pregnancy values. The effects of these physiological changes may severely compromise women with respiratory disease. Pulmonary function tests carried out in early pregnancy give a baseline value and should be repeated at regular intervals, if clinically indicated. Regular peak flow monitoring is a useful assessment in those with obstructive lung disease. Many women avoid taking drugs when pregnant and it is important that they are encouraged to continue their maintenance medication.

Table 3 Physiological changes of pregnancy affecting the respiratory system

Increased oxygen consumption (20%)
Increased metabolic rate (15%)
Increased resting minute ventilation (40–50%; tidal volume increased, ventilatory frequency unchanged)
Decreased FRC trimester III (VC unchanged)
Decreased arterial partial pressure of carbon dioxide

FRC = functional residual capacity; FEV_1 = forced expiratory volume in 1 s; VC = vital capacity; PEFR = peak expiratory flow rate.

Asthma occurs in ~1% of pregnant women; 10% of these will need hospital admission for an acute exacerbation. The course of asthma may improve, worsen or remain unchanged during pregnancy. Patients with asthma should be counselled in the antenatal period and encouraged to have epidural analgesia. If operative delivery is required, regional anaesthesia is the anaesthetic of choice; general anaesthesia is often poorly tolerated.

Obesity

The prevalence of obesity is currently rising in developed countries. Obesity is associated with increased risk of diabetes, hypertension, pre-eclampsia, thromboembolism and need for Caesarean section. The high incidences of ante-partum medical disease and emergency Caesarean section complicate anaesthetic care in the morbidly obese. When compared with normal patients, morbidly obese women suffered significantly more post-partum complications, including wound infection, deep venous thrombosis, pulmonary embolism, pulmonary oedema and post-partum myocardiopathy. Epidural anaesthesia is feasible; however, the high initial failure rate necessitates early catheter placement, critical block assessment and catheter replacement when indicated, and provision for alternative airway management. CSE may be more advantageous in this group of patients. The risks of general anaesthesia are significant.

Endocrine diseases

The most common endocrine diseases in the childbearing population are diabetes and thyrotoxicosis. These women are best managed in a combined clinic, where the obstetrician and endocrinologist manage the pregnancy and plan for delivery.

The diagnosis of gestational diabetes is based on the results of an oral glucose-tolerance test. Women with severe hyperglycaemia should be considered to have Type 1 or Type 2 diabetes and treated accordingly. In pregnancy, insulin requirements increase by up to 50% at term. The risks to the foetus increase in a linear fashion with increasing maternal glycaemia. Ante-partum treatment should be focused on the prevention of foetal complications. Diabetics have an increased incidence of pregnancy-induced hypertension, polyhydramnios, Caesarean section and pre-term labour. Gestational diabetes is not in itself an indication for Caesarean delivery. Nonetheless, the rates of Caesarean delivery amongst gestational diabetics are more than double those for non-diabetic women. For most of these women, 'stress free' delivery is advised to facilitate the control of plasma glucose; epidural analgesia is an integral part of management.

Haematological diseases

Thrombosis and thromboembolism were the most common direct causes of maternal death described in the CEMD 1997–1999 report.

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Physiological changes that occur in normal pregnancy result in a hypercoagulable state with increased fibrinogen and factors VII, VIII and XIII. Platelets, clotting and fibrinolytic factors are all activated. The number of deaths from thromboembolism after Caesarean section has fallen dramatically after the introduction and routine use of guidelines for thromboprophylaxis.

Women with haematological disease may have: (i) reduced oxygen carrying capacity (e.g. sickle-cell trait); (ii) increased risk of clotting (e.g. thrombophilia); or (iii) increased risk of bleeding (e.g. idiopathic thrombocytopenia, von Willebrand's disease). Ante-natal screening for anaemia, thalassaemia and sickle-cell disease is now routine in many parts of the world. Ante-natal assessment is best undertaken by a multidisciplinary team including a haematologist. Detailed plans for the management of labour and delivery should include the risks and benefits of regional analgesia and anaesthesia. If regional analgesia is contraindicated, the woman should be told what options are available to her, including the use of patient-controlled opioid analgesia.

Neurological diseases

Patients with a history of trauma, tumour, infection or cerebrovascular accident need to be assessed to determine whether there is any residual problem that will be affected by pregnancy or labour. Careful explanation and reassurance about regional analgesia and anaesthesia is important.

In women with established neurological disease (e.g. spina bifida, myasthenia gravis, epilepsy, multiple sclerosis), assessment should take account of the effect of the pregnancy and labour on the disease. Informed choices are much easier to make before labour and plans for analgesia and anaesthesia should ideally be made in the ante-natal period. Optimal seizure control during pregnancy remains an important goal for women with epilepsy. Those with spina bifida may have other risk factors (e.g. kyphoscoliosis, tethered spinal cord). Early consultation allows time for full investigation (including, if appropriate, MRI) and review of previous records and investigations. Although randomized controlled trials are unavailable, there is increasing clinical experience (collated by the Obstetric Anaesthetists Association High Risk Registry) of regional blocks being safely and successfully carried out in these women.

Musculoskeletal diseases

Musculoskeletal disease in pregnant women ranges from disability resulting from non-specific back problems to those who are severely disabled and wheelchair bound. Respiratory and cardiac function should be assessed in those with severe disease (e.g. severe kyphoscoliosis). The effect of each stage of the pregnancy on the disease needs to be monitored and the possibility of vaginal delivery should be assessed. Ante-natal consultation is important to ensure informed consent when considering any anaesthetic intervention.

Mental illnesses

Women with a history of psychiatric disorder, either after childbirth or at other times, should be assessed by a psychiatrist in the ante-natal period and a management plan instituted because of the risk of recurrence after delivery.

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See multiple choice questions 69–71.

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